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An Optimality Theoretic Perspective on Perfective Imbrication in siSwati

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ABSTRACT

Imbrication is a morphophonological change in many Bantu languages in which a morpheme *-il-/-ir-*, which may be glossed as perfective, stative or past (Hyman 1995), fuses with the verb stem through CV metathesis, consonant deletion and vowel coalescence, subject to varying requirements and degrees of productivity (Bastin 1983). This paper examines imbrication of the perfective suffix *-il-* in siSwati from the perspective of Optimality Theory (McCarthy and Prince 1996, Prince and Smolensky 2004), in which the realisations of input forms are selected through competing requirements of faithfulness to input forms and elimination of marked configurations. Drawing on Kayne's (1995) theory of the antisymmetry of syntax, it is proposed that the perfective suffix in siSwati is right-adjoined to the verb stem, in violation of this theory. Recasting the prohibition against right adjunction as a violable Optimality-Theoretic constraint, metathesis is motivated as a strategy to conceal the violation by fusing morphemes at the adjunction site.

***Keywords**: Bantu, siSwati, imbrication, optimality, antisymmetry.*

1. INTRODUCTION

Imbrication is a morphophonological change in many Bantu languages in which the morpheme *-il-/-ir-*, which may be glossed as perfective, stative or past (Hyman 1995), fuses with the verb stem (Bastin 1983), producing relatively opaque differences between input and output forms.[1] Across Bantu, imbrication exhibits variation in its triggering environments. It involves the modification of the verb stem or root in different ways, depending on the language. Imbrication has posed descriptive and analytical challenges in terms of explaining why it takes place and accounting for the types of morphophonological changes it causes.

One such imbricating suffix is the perfective morpheme *-il-* in siSwati. This paper proposes that imbrication in siSwati and, by extension, other Bantu languages, may be viewed as the outcome of one of the fundamental theoretical

[1] We are grateful to our two anonymous reviewers for observations and suggestions that have greatly improved the content and presentation of this paper.

premises of Optimality Theory (OT), that the output forms attested in human languages are the result of tension between faithfulness constraints, which disfavor deviating from input forms, and markedness constraints, which favor rectification of forms that violate the preferences of Universal Grammar (McCarthy and Prince 1996, Prince and Smolensky 2004, McCarthy 2002, Archangeli and Langendoen 1997, Kager 1999).

The paper is organised as follows. Section 2 describes the long perfect form of the verb in siSwati, which contains the imbricating perfective morpheme *-il-*, and contrasts it with the short perfect, which lacks *-il-*. Section 3 describes imbrication in the long perfect form. Section 4 describes constraints on the application of imbrication in siSwati, suggesting that they are purely morphological, and compares siSwati to Cibemba, another Bantu language with imbrication. Section 5 provides an OT-informed analysis that posits a marked syntactic structure as the motivation for imbrication and accounts for restrictions on it for in terms of relative strength of competing faithfulness constraints. Section 6 concludes.

2. THE PERFECTIVE SUFFIX *-IL-* IN SISWATI

Many Bantu languages have one or more verbal suffixes *-il-* or *-ir-*, with perfective and other meanings, used concomitantly with final vowel *-e* (Bastin 1983). In siSwati, *-il-* is used in a verb form commonly referred to as the long perfect. The examples in (1) and (2) illustrate the perfective *-il-* in siSwati.[2]

(1) ngi-bon-i:l-e
SM1s-see-PF-FV
'I have seen'

(2) si-val-i:l-e
SM1p-close-PF-FV
'we have closed'

[2] Abbreviations used in the examples are as follows: DEM: demonstrative, FV: final vowel, N: noun class prefix, OT: Optimality Theory, PASS: passive, PF: perfective, PRES: present, REC: reciprocal, SM: verbal subject morpheme. Numbers in the glosses are Bleek-Meinhof noun class numbers, except for 1s and 1p, which indicate 1st person singular and plural, respectively. Colons have been inserted in the examples to indicate lengthened vowels, but are not part of standard siSwati orthography. Morphemes are separated by hyphens, as are their meanings in the glosses. A slash in the gloss indicates morpheme fusion. "n.d." in the references means "not dated".

In the verb forms in the examples in (1) and (2), the morpheme *-il-* is suffixed to the verb stems *-bon-* and *-val-*, followed by the vowel *-e*.[3]

The long perfect contrasts syntactically with another verb form, the short perfect, in which the perfective *-il-* is absent and the final vowel *-e* is lengthened, illustrated in example (3) for example (1).

(3) ngi-bon-e: ba-ntfu

SM1s-see-PF/FV N2-person

'I have seen people'

In example (3), the lengthened final vowel *-e* is an example of one of the few functional morphemes in siSwati with vowel length.[4] Otherwise, vowel length in siSwati occurs only phrase-finally.

The differences between the long and short perfects in examples (1), (2) and (3) are significant because of what they indicate about the syntactic distribution of these forms. In siSwati, the long perfect always occurs phrase-finally, whereas the short perfect only occurs phrase-medially. In this respect, siSwati shows the same pattern for the long and short perfects as Zulu (van der Spuy 1993, Buell 2005).

The representation of the long perfect in examples (1) and (2) raises the structural issue of whether or not the perfective suffix *-il-* forms a single morpheme with the final vowel *-e*. We have followed the practice of Hyman (1995) and others of representing them as two morphemes. At the same time, we note that this bimorphemic analysis is consistent with three observations.

First, when a long perfect verb form includes the passive morpheme, this morpheme appears between the perfective suffix *-il-* and the final vowel *-e*, as illustrated in example (4).

(4) ku-phek-i-w-e

SM15-cook-PF-PASS-FV

'it has been cooked' ("it"=kudla 'food', Class 15)

In example (4), the passive extension *-w-* follows the perfective suffix *-il-*, with deletion of the suffixal consonant to resolve the resulting consonant cluster. The final vowel *-e* follows *-w-*. (Hyman (1995) reports a similar pattern in Cibemba.)

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[3] Example (1) illustrates the observation that siSwati lacks vowel harmony in verbal extensions, such as the applicative and causative extension, and lacks both vowel and nasal harmony in the perfective suffix. See Malambe (2015) for an account of mid vowel assimilation in siSwati.

[4] Another example of a morpheme with vowel length in siSwati occurs in the remote past: /u-a:-hamb-a/ → [wa:ha:mba] 's/he went'.

This observation is consistent with an analysis of *-il-e* as bimorphemic, requiring only a statement about morpheme ordering. If *-il-e* is analysed as monomorphemic, then the passive extension must be analysed as an infix, needing additional prosodic statements governing its insertion.

Second, the short perfect may be analysed as a variant form of the long perfect in which the perfective suffix *-il-* is omitted, with concomitant compensatory lengthening of the final vowel *-e*. If *-il-e* is analysed as bimorphemic, then the target of deletion becomes a single morpheme, rather than part of a single morpheme, which must be identified phonologically or prosodically.

Third, as one reviewer points out, *-il-* never appears with any final vowel apart from *-e*, so there is no immediate motivation for regarding them as separate morphemes. Still, the long perfect forms part of a verbal system in which every other verb form ends with a vowel that is a separate morpheme. Analysing *-il-* and *-e* as a single morpheme would run counter to the pattern established by the rest of the system, something that children acquiring siSwati may take into account.

This section has described the long and short perfect verb forms in siSwati, noting also that siSwati has vowel length in penultimate syllables, but no phonemic vowel length (apart from a few functional morphemes). The analysis of *-il-e* as two morphemes has also been justified. The next section takes up imbrication in the siSwati long perfect.

3. IMBRICATION IN THE LONG PERFECT

In common with other Bantu languages with this morpheme, perfective *-il-* in siSwati undergoes morphophonological changes, referred to as imbrication by Bastin (1983), which have the effect of fusing the suffix with verb stems belonging to a morphophonologically defined subclass (see Section 4). Imbrication in siSwati is illustrated in the examples in (5) and (6). The (a) examples in (5) and (6) show the order of morphemes underlying the (b) examples. The (b) examples show the surface realisation of the same verb form when *-il-* is imbricated with the verb stem.

(5a) /ngi-phapham-il-e/

SM1s-be awake-PF-FV

(5b) ngi-phaphe:m-e

SM1s-be awake/PF-FV

‘I am awake’

(6a) /ba-hlek-an-il-e/

SM2-laugh-REC-PF-FV

(6b) ba-hleke:n-e

SM2-laugh/REC/PF-FV

'they laugh at each other'

In the imbricated verb forms in examples (5b) and (6b), the underlying perfective morpheme *-il-* is omitted and the vowel in the second syllable of the verb stem is changed from /a/ to /e:/. Note that the vowel in the penultimate syllable of the imbricated forms is lengthened, as is expected in the phrase-final long perfect form, described in Section 1 above.

This section has described imbrication in perfective verb forms in siSwati. The next section describes morphological constraints on this change.

4. MORPHOLOGICAL CONSTRAINTS ON IMBRICATION IN SISWATI

As indicated above in Section 3, the morpheme *-il-* in siSwati does not trigger imbrication in all long perfect verb forms. The same is true in other Bantu languages: imbrication targets only a subset of verbs. Hyman (1995: 4), citing Bastin (1983), lists four criteria for identifying verb stems which block imbrication, given in (7).

(7a) the number of syllables in the verb stem

(7b) the final consonant of the verb stem

(7c) the vowel preceding the final consonant of the verb stem

(7d) the identity of the last morpheme of the verb stem

Criteria (7a) and (7d) may, in some cases, be ways of accounting for the same phenomenon. Hyman (1995: 4) states that, in Cibemba, verb stems that permit imbrication must be at least two syllables long (excluding the final vowel). On the other hand, Kula (2002) notes, also for Cibemba, that imbrication is only possible in verb stems, not verb roots, i.e., verb roots to which verbal extensions have been added (verbal extensions which are no longer productive, or "frozen", in Kula's terminology, also convert roots into stems). Since adding verbal extensions has the effect of adding syllables to the verb root, counting syllables or counting extensions could add up to the same thing.

In siSwati, criterion (7d) may be most relevant for identifying the subset of verb stems that undergo imbrication. Taljaard, Khumalo and Bosch (1991: 54) state that, in siSwati, only verb stems ending in *-ala, -ama, -ana, -asa, -atsa, -ela* and *-ula* undergo imbrication. One of these endings, *-ana,* is the reciprocal verbal extension, which is morphologically *-an-*, as in example (6a) above. It is likely that the remaining endings belong to the category of frozen extensions.[5] The subset of verbs that undergo imbrication in siSwati also includes verb stems with one syllable, such as *-tsats-a* 'take', with the frozen extension *-ats-*, whose perfective form is imbricated *-tsetse,* in contrast to the syllabic restriction imposed on imbrication in Cibemba. Also included in this set is the verb *-sal-a* 'remain', with the extension *-al-*, whose imbricated form is *-se:le*; this form may be compared with the perfective form of the segmentally similar *-sal-a* in Cibemba, which is the non-imbricated *-sal-il-e,* due to the monosyllabic verb stem (Hyman 1995: 4). One irregular perfective verb form is *-hleti,* the imbricated form of the verb *-hlal-a* 'sit'. In light of these considerations, we posit that the sole generalisation governing imbrication in siSwati is that the verb stem must contain either a productive or frozen verbal extension.

This section has described constraints on imbrication in siSwati, concluding that they are wholly morphological, not prosodic. The next section develops an Optimality-Theoretic perspective on the motivation and distribution of imbrication in siSwati.

5. An Optimality-Theoretic Perspective on Imbrication in siSwati

Given the disparity between input and output forms, imbrication has posed descriptive and analytical problems, both in terms of the motivation for it, and the reasons for the morphophonological restrictions on it. In this section, we suggest that both the occurrence of imbrication in siSwati and other Bantu languages, and at the same time, its limited distribution, reflect the tension between faithfulness and markedness constraints that is the foundation of theorising in OT. We situate the discussion within a syntactic approach to inflectional morphology, which treats it in terms of phrase structure (Pollock 1989, Demuth and Harford 1999, Harford and Demuth 1999, Buell 2005, Harford 2010).

As Hyman (1995: 5) points out, it is possible to write transformations that achieve the effect of imbrication. However, such transformations do little to clarify why and where imbrication takes place. A more promising path to a solution, as Hyman (1995: 6) indicates, begins with decomposing imbrication into three separate aspects, a strategy also pursued by Key (n.d.). First, there is

5 See Doke (1990), pp. 150 ff., for the equivalent frozen extensions in Zulu.

metathesis of the vowel /i/ of the suffix and the final consonant of the verb stem. In the example in (8b), the metathesising segments are italicised and bolded.

(8a) ngi-phapha***m-i***l-e

(8b) ngi-phaph[a] ***i m*** [l]-e

In example (8a), morphemes are separated by hyphens, indicating that the segments that undergo metathesis belong to separate morphemes. In example (8b), the outcome of metathesis is that the vowel /i/ of the perfective suffix has moved to the left of the final consonant of the verb stem, with the result that it is now adjacent to the verb stem vowel /a/, whereas /m/, the final consonant of the stem, ends up adjacent to the /l/ of the perfective suffix.

These rearrangements provide the conditions for the two other changes, vowel coalescence and consonant deletion, which reflect wider phonotactic constraints operative in siSwati and other Bantu languages. The juxtaposition of the two vowels /a/ and /i/ in (8b) results in vowel hiatus, a marked sequence in Bantu languages, for which a number of resolution strategies are used (Aoki 1974, Khumalo 1987, Harford 1997, Sibanda 2009, Kadenge 2010, Mudzingwa and Kadenge 2011, Mudzingwa 2013, Kadenge and Simango 2014). In this case, vowel hiatus is resolved by vowel coalescence, a phenomenon widely attested in Bantu languages (see previous references). Vowel coalescence appears in a number of morphophonological contexts in siSwati, including the formation of demonstrative pronouns, as illustrated in the examples in (9).

(9a) /la-a/ → [lá]
DEM-SM6 ‘this (Class 6)’

(9b) /la-i/ → [lé]
DEM-SM9 ‘this (Class 9)’

(9c) /la-u/ → [ló]
DEM-SM1 ‘this (Class 1)’

(Examples from Taljaard, Khumalo and Bosch 1991: 78)

In examples (9a-c), the verbal subject morphemes for Classes 6, 9 and 1 are suffixed to the demonstrative morpheme *la*, resulting in coalescence of the adjacent vowels (Taljaard, Khumalo and Bosch 1991: 78). The pattern of vowel coalescence in example (9b) is also seen in imbricated verb forms such as in examples (5) and (6) above.

Similarly, the juxtaposition of /m/ and /l/ in example (8b) is a dispreferred consonant cluster (Hyman 1995, Key n.d., Harford and Malambe 2015), resolved by deleting /l/. The choice of which consonant to delete, the consonant /l/ of the suffix, rather than the consonant /m/ of the verb stem, may reflect a preference to maximise information about the lexical verb, at the expense of the functional aspect morpheme, as pointed out by Hyman (1995: 6). This deletion of the suffix consonant rather than the final consonant of the verb stem represents another parameter of variation in imbrication across Bantu languages. As Key (n.d.) notes, Bantu languages with imbrication such as Cibemba and Chilungu delete the suffix consonant (/l/ or /r/) rather than the stem consonant, but Ciluba is one that deletes the stem consonant (Lukusa 1993).

Seen from this perspective, it becomes apparent that the key change underlying imbrication is metathesis. Once metathesis is activated, the other two changes follow from more general patterns seen in Bantu languages. Now, metathesis is an unusual process cross-linguistically (Blevins and Garrett 1998) and it is not obvious that it applies in this context, since the transposition itself is obliterated by the repair of the VV and CC sequences that it produces. As pointed out to us by our reviewers, another potential analysis is that the verb stem change takes place because of an assimilation-at-a-distance process such as umlaut in Germanic plurals, in which a plural suffix with a high vowel triggers raising of the vowel in the noun stem (see, for example, Anttilla 1989). According to this analysis, the /e/ of the final vowel triggers assimilation of the verb stem vowel to /e/ in the preceding syllable, without recourse to metathesis. The difficulty with the umlaut analysis is that it accounts only for the vowel changes induced by imbrication, without accounting for the concomitant consonant deletion. The advantage of the metathesis analysis is that it creates the conditions for both the vowel change and consonant deletion with a single transposition which brings the two sets of vowels and consonants together. If vowel raising were triggered by an assimilation-from-a-distance process, consonant deletion would have to be motivated independently without recourse to the consonant cluster as a motivation.

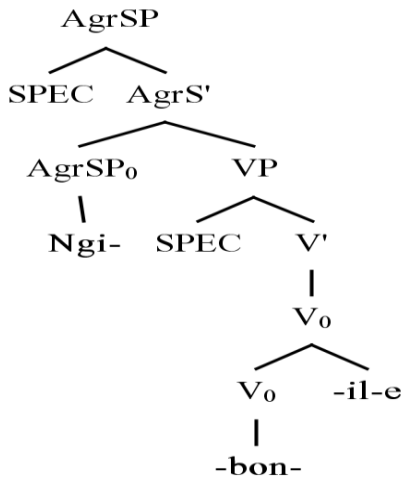
The question of why metathesis takes place in this context underpins Key's (n.d.) analysis of imbrication in Chilungu (Bickmore 2007), in which he proposes that the motivation for metathesis is to enable the resulting juxtaposed vowels to form a single long vowel in penultimate position, thereby forming a trochaic foot at the right edge of the verb form (Key n.d.: 5). Imbrication in Bantu would thus fall into a more general cross-linguistic pattern expressed by the Optimality constraint Stress-to-Weight (Kager 1999), which prefers bimoraic metrical heads. For siSwati in particular, it would need to be assumed that trochaic feet occur at the right edges of phrases, but not words. Since the long perfect is always phrase-final, candidate forms would always be evaluated by this constraint, subject to the morphological restrictions noted in Section 4 above. Stress-to-Weight seems unparsimonious as an explanation of imbrication, considering the violations of faithfulness that it incurs. In phrase-final contexts

without the long perfect form, in siSwati and other Bantu languages, the penultimate vowel is simply lengthened and there is no apparent reason why lengthening of the vowel of the perfective suffix would not achieve the preferred outcome as well as metathesis.

Another avenue of investigation would compare metathesis in Bantu imbrication to metathesis of phonetically similar segments in the history of Romance languages, which has been given explanations based on sonority (Russell and Bradley 2009). However, without arguing against such an explanation, we will explore another possibility, an explanation based on syntactic structure, pursuing an analytic trend that treats verbal inflectional morphology in terms of phrase structure, with particular application to Bantu (Pollock 1989, Carstens and Kinyalolo 1989, Demuth and Harford 1999, Harford and Demuth 1999, Buell 2005, Harford 2008, Harford 2010).

Our analysis begins with the suggestion that the perfective suffix has a different structural relationship with the verb stem than the other prefixal tense/aspect/modality (TAM) morphemes in siSwati and other Bantu languages. In particular, prefixal verbal inflectional morphemes are the heads of maximal projections that embed the VP, as assumed in the previous references. In contrast, we suggest that the suffixal perfective morpheme is adjoined to the verb stem at the right edge. Example (10) is a proposed phrase structure tree for example (1) *ngibonile*.

(10)



In the tree in (10), the verbal subject agreement morpheme is the head of a maximal projection, AgrSP (Agr=agreement, S=subject, P=phrase). The VP is structurally its complement. The relationship between *ngi-* and *-bon-* is thus between the head of a phrase and the head of the phrase embedded as its

complement. On the other hand, the relationship between *-bon-* and *-il-e* is one of right adjunction.

The assumptions reflected in the tree in (10) have two theoretical sources. The first is the Split-INFL hypothesis of Pollock (1989), which proposes that verbal inflectional morphemes are the heads of maximal projections that embed the VP. In subsequent work applying this hypothesis to Bantu languages, the prefixal subject agreement and TAM morphemes have been analysed in this way (see previous references).

The second theoretical source is Kayne's (1995) theory of the antisymmetry of syntax, which assumes that differences in linear order (in this case, of verbal inflectional morphemes with respect to the verb stem) reflect differences in phrase structural relations (see also Julien 2002). This assumption underlies the different structural relations of the verbal inflectional prefix and suffix in the proposed tree in (10). The prefixal verbal subject agreement morpheme is the head of a phrase that embeds the VP as its complement, in other words, the type of right-branching structure that emerges as unmarked in antisymmetry theory. The suffixal perfective morpheme, precisely because it is a suffix, cannot enter into this type of structural relationship with the verb stem, but, because it is on the right, may only be adjoined to it. We assume that the absolute prohibitions of Kayne's theory may be recast as OT constraints (see Morimoto 2001.)

However, this scenario entails another structural configuration, right adjunction, which the theory of antisymmetry predicts to be non-existent or disfavored, in OT terms. Here is where we situate the relevance of metathesis in imbrication. Since metathesis in this context involves the final C of the verb stem and the initial V of the suffix, it targets precisely the right-adjunction site between the two morphemes. The effect of metathesis is therefore to eliminate the right-adjunction structure by fusing the two morphemes. In this way, imbricated verb forms avoid violating constraints that disfavor right adjunction. Seen in this light, metathesis is a strategy for avoiding the violation of syntactic markedness constraints, in OT terms.

Now, if right adjunction is a marked structure, why do Bantu languages have restrictions on its application? Two types of restrictions are relevant. First, why does imbrication not apply in all verb stems which take perfective *-il-e*? Second, why is perfective *-il-e* the only suffix to undergo imbrication? We address these questions in turn. Overall, our explanations rely on the basic architecture of OT, which explains language variation and diachronic change in terms of the tension in ranking between faithfulness and markedness constraints, which causes constraints from both camps to rise and fall in the constraint rankings of individual languages. We suggest that the varying morphophonological restrictions on imbrication across Bantu languages reflect this give-and-take between the two basic categories of constraints. The outcome is that a favored or disfavored configuration may or may not appear where expected due to constraints that are ranked higher in a particular context.

For example, we concluded in Section 4 above that imbrication in siSwati only applies when the verb stem contains a verbal extension, either productive or frozen. This pattern suggests the intervention of a constraint favoring faithfulness in lexical stems (as opposed to functional stems) (McCarthy and Prince 1995) that is ranked more highly than the constraint disfavoring right adjunction. Hence, imbrication takes place only when the altered segmental material is an extension, not a verb root (see examples (1) and (2) above, in which the perfective *-il-* does not imbricate because it is suffixed to a verb root). The outcome is that imbrication occurs only in a subset of verb forms with the perfective suffix. Seen in this light, the criteria that determine which subsets of verb stems permit imbrication in Bantu languages listed in example (7) above appear as a summary of the ways in which faithfulness can push back against markedness in Bantu imbrication.

Also, imbrication in Bantu languages appears to be restricted to the reflexes of a particular Proto-Bantu suffix+final vowel combination whose reconstructed form is cited by Hyman (1995: 3) as **-ɟid-e* and whose range of variation in the daughter languages is described by Bastin (1983). It is therefore possible to analyse the constraint disfavoring right adjunction as lexically indexed to the perfective suffix, meaning that the constraint is not evaluated unless the perfective suffix is present in a verb form. Such an account of imbrication is proposed by Key (n.d.) within the context of OT research on lexically indexed constraints, including Coetzee and Pater (2005) and Itô and Mester (2001). The outcome, then, is that other verbal suffixal morphemes are not subject to imbrication because they are not indexed to the constraint disfavoring right adjunction.

This section has developed an Optimality-Theoretic perspective on the motivation and distribution of imbrication in siSwati and, by extension, other Bantu languages. It has suggested that imbrication functions as a strategy to repair the marked syntactic configuration of right adjunction by fusing the relevant morphemes and hence concealing the violation. It has been suggested that restrictions on the productivity of imbrication are due to factors well attested cross-linguistically, such as faithfulness constraints targeted at lexical stems and morphologically indexed constraints. The next section concludes.

6. CONCLUSION

This paper has described and analysed perfective imbrication in siSwati from an Optimality-Theoretic perspective. It has used the Split INFL hypothesis and the theory of antisymmetry to propose that the suffixation of perfective *-il-* in siSwati creates a disfavored right adjunction structure. Imbrication is motivated as a strategy to mask this violation by fusing the perfective morpheme with the verb stem, eliminating the offending boundary. The observation that imbrication is limited to subsets of verb stems and applies only to one particular morpheme

is taken as an outcome of the interaction of OT faithfulness and markedness constraints.

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